

## New symbiotic associations involving polynoids (Polychaeta, Polynoidae) from Atlantic waters, with redescrptions of *Parahololepidella greeffi* (Augener, 1918) and *Gorgoniapolynoe caeciliae* (Fauvel, 1913)

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### Abstract

Britayev, T.A., Gil, J., Altuna, Á., Calvo, M. and Martín, D. 2014. New symbiotic associations involving polynoids (Polychaeta, Polynoidae) from Atlantic waters, with redescrptions of *Parahololepidella greeffi* (Augener, 1918) and *Gorgoniapolynoe caeciliae* (Fauvel, 1913). *Memoirs of Museum Victoria* 71: 27–43.

Different circumstances such as sampling methodology, sample sorting or taxa distribution among different experts often lead symbiotic associations to remain hidden and the mode of life of the involved partners are either not defined or directly reported as free living. This was apparently the case of *Parahololepidella*, a genus proposed by Pettibone (1969) to include *Hololepidella greeffi* Augener, 1918, reported as free-living from shallow waters off São Tomé and Cabo Verde Islands (W Africa). In this paper, we report for the first time the symbiotic status of *P. greeffi* (Augener, 1918), which lives in association with the antipatharian *Tanacetipathes* cf. *spinescens* (Gray, 1857), based on new materials collected in São Tomé Island. In addition to the originally described features, the species is characterized by a variable presence of cephalic peaks and by an irregular distribution of elytra from segment 32–33, which may be asymmetrical (within the same individual) and differ between individuals. A list of all known polychaete species associated with antipatharian corals is also provided. We also report new findings of *Gorgoniapolynoe caeciliae* (Fauvel, 1913) from deep waters of the Atlantic coasts of the Iberian Peninsula, living in association with the octocorals *Candidella imbricata* (Johnson, 1862) (first report for the Spanish waters) and *Corallium niobe* Bayer, 1964. The diagnosis of *Gorgoniapolynoe* is emended and we suggest that *G. corrallophila* (Day, 1960) should be referred to a different genus and that *G. pelagica* Pettibone, 1991a should be considered as *nomen dubium*. The Iberian *G. caeciliae* fits well with the re-description by Pettibone (1991a), except for the presence of clavate papillae on dorsal cirri, which were neither mentioned nor figured in previous descriptions.

### Keywords

New symbiotic associations; Polynoidae; Myriopathidae; Primnoidae; Coralliidae; São Tomé Island; Cabo Verde Island; Iberian Peninsula.

### Introduction

Among the polychaete families, the Polynoidae includes the highest number of symbiotic species. There were about 163 species involved in more than 420 relationships reported by Martin & Britayev (1998), but the number has increased continuously since then and currently exceeds 200 species involved in about 550 relationships (D. Martín, unpublished data).

Different circumstances (such as sampling methodology, sample sorting, or taxa distribution among the different experts)

often lead symbiotic associations to remain hidden. Consequently, the mode of life of the involved partners is either not defined or directly reported as free living. Some new reports may correspond to these “hidden” associations, which turned to be recognized as symbiotic when new or more precise observations were carried out. This is the case for *Parahololepidella*, a genus proposed by Pettibone (1969) to include *Hololepidella greeffi* Augener, 1918. All known specimens of this species were reported as free-living from shallow waters off São Tomé and Cabo Verde Islands (Augener, 1918; Pettibone, 1969).

New specimens of this species were found among newly collected materials from São Tomé Island, housed and sorted in the Museo Nacional de Ciencias Naturales (MNCN-CSIC) of Madrid, and from Cabo Verde Island (collected during an expedition to the Canarias – Cape Verdian region, CANCAP), housed and sorted in the Naturalis - Nationaal Natuurhistorisch Museum, Leiden (NNMN). All newly collected specimens were living in association with the antipatharian *Tanacetipathes* cf. *spinescens* (Gray, 1857) (Myriopathidae). Consequently, we first report here the symbiotic status for *Parahololepidella greeffi* (Augener, 1918). Moreover, as some morphological details were not properly described in the original description, we provide a full re-description of the species, including some considerations on the status of *Hololepidella fagei* Rullier, 1964. A list of all known polychaete species associated with antipatharian corals is also provided.

Furthermore, we also report on new findings of *Gorgoniapolynoe caeciliae* (Fauvel, 1913) from deep waters off the Atlantic coasts of the Iberian Peninsula, living in association with the octocorals *Candidella imbricata* (Johnson, 1862) and *Corallium niobe* Bayer, 1964. Both the genus and the species are re-described based on these newly collected materials.

## Material and methods

The specimens of *P. greeffi* and its host antipatharian *Tanacetipathes* cf. *spinescens* were collected in different locations off São Tomé and Cabo Verde Islands (see the corresponding Examined Material section and Table 1 for a detailed list of samples and locations). Specimens from São Tomé Island were directly fixed and preserved in 70% ethanol, while those from Cabo Verde were fixed in formaldehyde (10% in seawater) and later rinsed with fresh water and transferred to 70% ethanol.

The specimens of *G. caeciliae* were collected during the 2010 and 2011 expeditions of the INDEMARES project by the Spanish Institute of Oceanography (IEO), at the Galicia Bank (associated with *Candidella imbricata*) and at the Avilés Canyon System (associated with *Corallium niobe*). Samples were collected with the help of a hard bottom grab (“Draga de roca” in Spanish, DR in the respective sample codes). They were also directly fixed and preserved in 70% ethanol. Voucher specimens are deposited at the IEO (Gijón Laboratory, Spain) and the Okendo Museum (Donostia-San Sebastián, Spain).

Light microscope micrographs of relevant morphological characters were made at the Laboratory of Microscopy and Digital Photography of the CEAB, with the help of a ProgRes C10 Plus digital camera (Jenoptics, Jena) attached to a Zeiss Axioplan compound microscope (body) and a CT5 digital camera (Jenoptics, Jena) attached to a SMZ1000 Nikon stereomicroscope (parapodia). Drawings of parapodia were made using an Olympus U-DA camera lucida attached to an Olympus BX-41 microscope.

Abbreviations in text: af: anterior fragment; pf: posterior fragment; L: length; WW: width without parapodia and without chaetae; WC: width with parapodia and chaetae.

## Taxonomic account

Family **Polynoidae** Kinberg, 1856

Subfamily **Polynoinae** Kinberg, 1856

Genus ***Parahololepidella*** Pettibone, 1969

*Type species. Hololepidella greeffi* Augener, 1918.

**Diagnosis.** Body long, slender, flattened, with sides nearly parallel, tapered posteriorly, with numerous segments (up to 140 or more). Elytra numerous up to 50 and more pairs, on segments 2, 4, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 26, 29, 32, thereafter irregularly arranged on alternate segments, often asymmetrical, with different number on right and left sides. Elytra oval smooth, without tubercles and micropapillae; first pairs medium sized, usually covering mid-dorsum; following ones very small, leaving mid-dorsum and parapodia uncovered. Prostomium bilobed, subtriangular anteriorly, with or without distinct cephalic peaks, with two palps and three antennae. Ceratophore of median antenna in anterior notch; lateral antennae inserted ventrally. First (tentacular) segment with a pair of tentaculophores inserted laterally to prostomium, with 1-2 aciculae and one slightly serrated unidentate notochaeta; facial tubercle prominent; mouth surrounded by two lateral lips, one dorsal with six–seven lobes, and one large ventral lip with 7-9 lobes. Second (buccal) segment with first pair of elytra, sub-biramous parapodia and long, tapering ventral cirri; without nuchal fold. Parapodia sub-biramous. Notopodia small, digitiform; notochaetae short, stout (not as stout as neurochaetae), tapering to blunt tips, unidentate. Neuropodia with longer rounded prechaetal lobes with subacicular digitiform processes; postchaetal lobes short, rounded; neurochaetae stout, with faint spinous regions, and slightly hooked, unidentate all of same type. Dorsal cirri smooth, with cylindrical, relatively long cirrophores and very long styles. Dorsal tubercles absent. Ventral cirri short, tapering. Nephridial papillae short, bulbous.

***Parahololepidella greeffi*** (Augener, 1918)

Zoobank LSID. <http://zoobank.org/urn:lsid:zoobank.org:act:FAED770C-2A9C-4EF6-AEC2-156863AED046>

(Figs. 1-7)

*Hololepidella greeffi*: Augener (1918), p. 148, pl. 2, figs. 22-24, pl. 3, fig. 52, text-fig. 9; Hartman (1959), p. 81; Rullier (1964), p. 130, fig. 3.

*Hololepidella fagei*: Rullier (1964), p. 132, fig. 4; Hartman (1965), p. 9.

*Parahololepidella greeffi*: Pettibone (1969), p. 54–55, fig. 4; Kirkegaard (1983), p. 192.

**Material examined.** Cabo Verde Archipelago. Santiago Island, SW coast near Ponta da Cidade, 14°54'N 23°38'W. Sta. CANCAP 7.D01, depth to 22 m, one specimen af and pf (NNMN 24481) on *Tanacetipathes* cf. *spinescens*, loose boulders on coarse sand, scuba diving, 20-21.08.1986, “Tydeman” Cabo Verde Islands Exped., 1986. W of Boa Vista Island, W of Ilhéu de Sal Rei, 16°11'N 23°00'W, Sta. CANCAP 7.081, depth 70 m, one complete specimen (NNMN 24644) on *Tanacetipathes* cf. *spinescens*, antipatharians and sponges, 1.2 m Agassiz trawl, 28.08.1986, “Tydeman” Cabo Verde Islands Exped., 1986.

Table 1. List of samples collected during the RSTP Cruise (2006) where *Parahololepidella greeffi* occurred in association with *Tanacetipathes* cf. *spinescens*. N: Number of worms per sample; WT: Water temperature (°C); Depth (m); fr: fragment.

Date	MNCN Catalogue Reference	N	Island	Station	Coordinates	WT	Depth
14/01/06	16.01/13707	8	São Tomé Is.	Lago Azul 2	00°24'19.0" N 06°36'26.6" E	27	20-25
15/01/06	16.01/13708	4	São Tomé Is.	Diogo Vaz 2	00°18'97.1" N 06°30'23.3" E	28	5-15
15/01/06	16.01/13709	1	São Tomé Is.	Diogo Vaz 1	00°18'53.2" N 06°29'23.3" E	27	20-25
18/01/06	16.01/13704	1	São Tomé Is. - Rolas Is.	Pedra do Braga	00°00'57.94"N 06°30'52.03"E	28	15-20
18/01/06	16.01/13706	1fr	São Tomé Is. - Rolas Is.	Pedra do Braga	00°00'57.94"N 06°30'52.03"E	28	15-20
18/01/06	16.01/13705	1	São Tomé Is. - Rolas Is.	Pedra do Braga	00°00'57.94"N 06°30'52.03"E	28	15-20

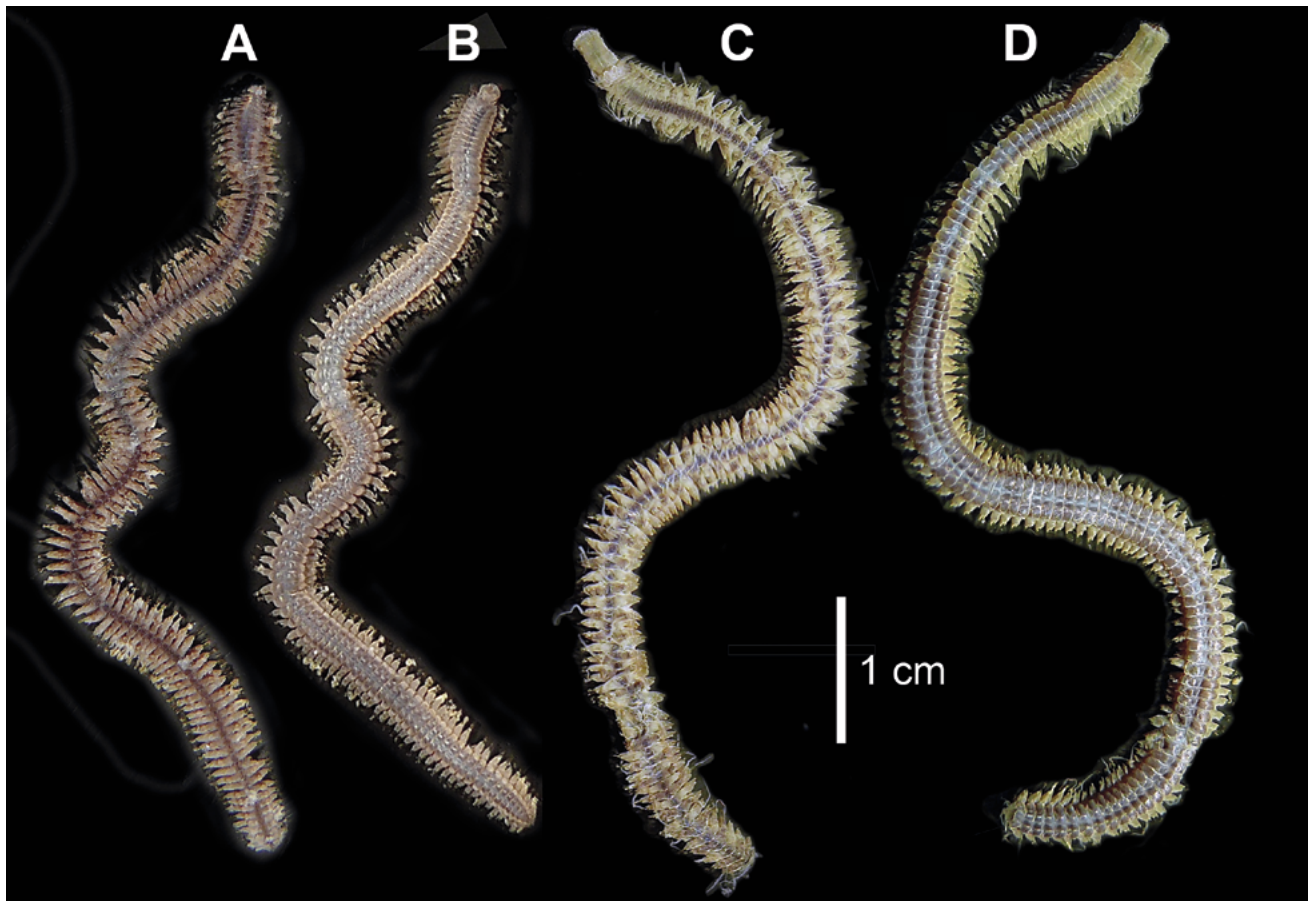


Figure 1.- *Parahololepidella greeffi*. MNCN 16.01/13708. (A, B) and MNCN 16.01/14341 (C, D). Adults in dorsal (A, C) and ventral (B, D) view.

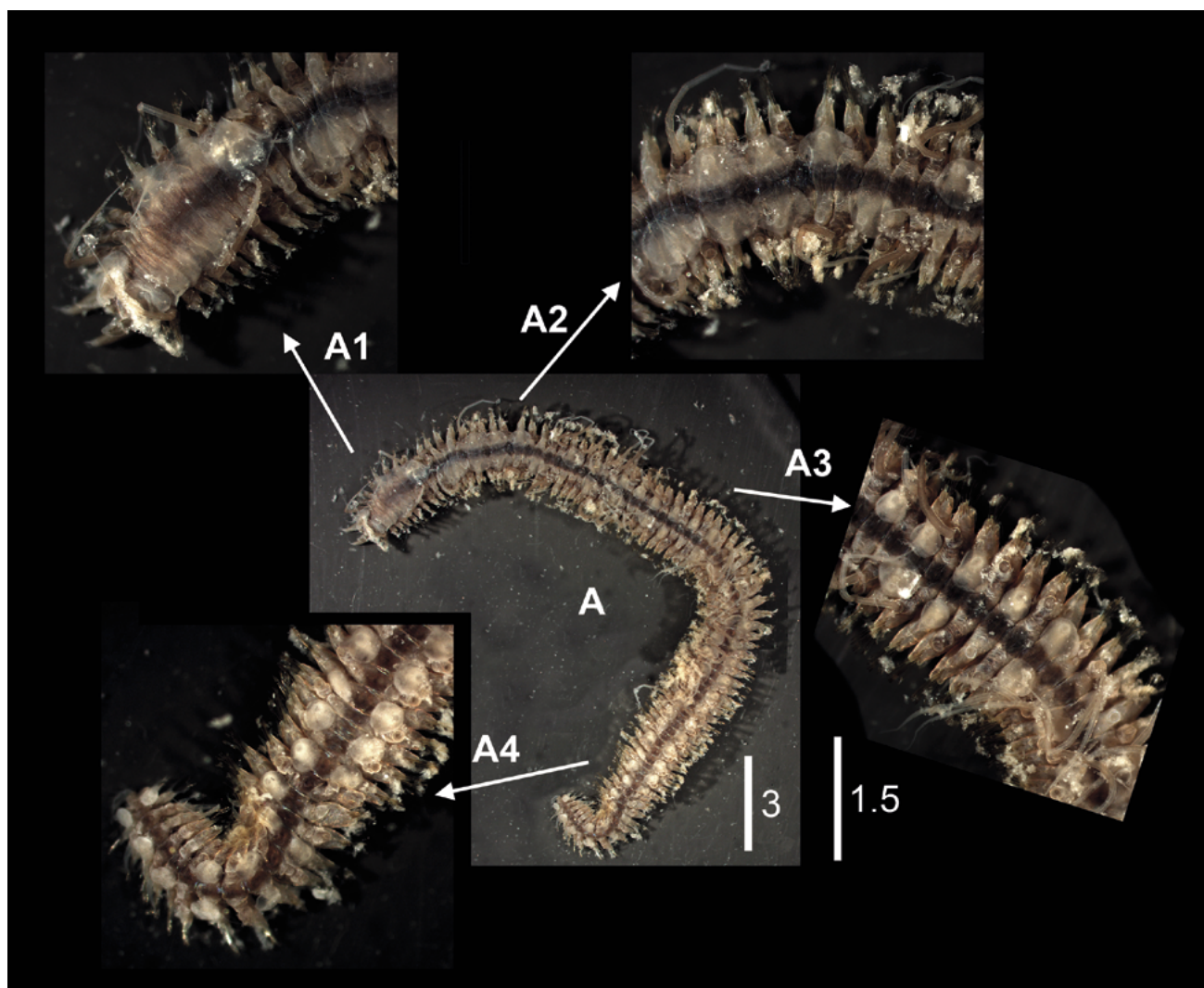


Figure 2.- *Parahololepidella greeffi*. MNCN 16.01/13708. Juvenile. A. Entire view. A1 – A4. Detail of the anterior end (A1), mid-anterior region (A2), mid-posterior region (A3), and posterior end (A4). Scale bars are cm.

São Tomé e Príncipe Archipelago. 1 syntype, Ilha das Rolas, Zoological Museum of Hamburg (ZMH 5692); 16 worms (plus some fragments) on *Tanacetipathes* cf. *spinescens*, collected during the Republic of São Tomé e Príncipe (RSTP) cruise by CPD Service Supporting Science Research (Table 1).

**Description.** Based mainly on a well-preserved specimen, broken in two fragments, NNMN 24481). Body long, slender, dorso-ventrally flattened, with sides nearly parallel, tapering posteriorly, with up to 140 or more segments (figs. 1, 2). Without dorsal ciliary bands.

Prostomium slightly wider than long; cephalic peaks present or absent; ceratophore of median antenna in anterior notch, style smooth, tapering, longer than palps; lateral antennae inserted ventrally to median antenna, styles smooth, tapering; anterior pair of eyes dorso-lateral on widest part of prostomium, posterior pair dorsal, near posterior prostomial margin, slightly

smaller than anterior ones; palps tapering. Facial tubercle prominent; mouth surrounded by two lateral lips, one dorsal with 6-7 lobes, and one large ventral lip with 7-9 lobes. Pharynx with four light-brown jaws, all similar in shape and size; nine pairs of large marginal pharyngeal papillae.

First (tentacular) segment with a pair of tentaculophores inserted laterally to prostomium, with one, rarely two aciculae and one slightly serrated unidentate notochaeta, with dorsal and ventral tentacular cirri, styles smooth, tapering. Second (buccal) segment with first pair of elytra, sub-biramous parapodia and long, tapering ventral cirri. Nuchal fold absent. Following segments with ventral cirri short, not reaching to tip of neuropodium. Cirriferous segments without dorsal tubercle. Dorsal cirri smooth, with cylindrical, relatively long cirrophores and very long styles.

Elytra numerous up to 50 and more pairs, on segments 2, 4, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 26, 29, 32, thereafter irregularly



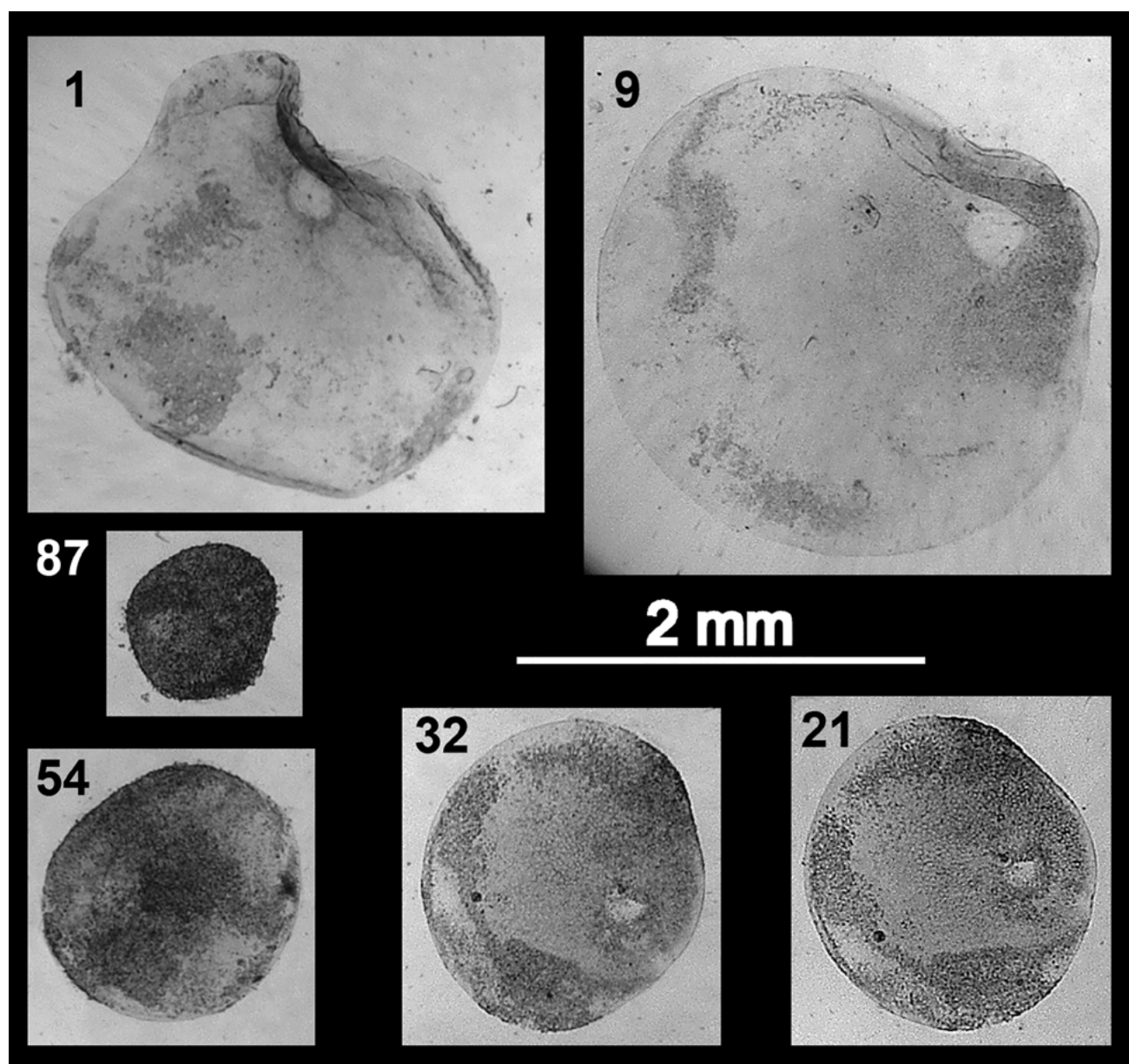


Figure 3.- *Parahololepidella greeffi*. MNCN 16.01/13708. Elytrae. Numbers represent the segment from which elytra were removed.

arranged on alternate segments, often asymmetrical, with different number on right and left sides (Table 2). Elytra almost oval in outline, smooth, soft, tubercles and micropapillae absent; first 11-12 pairs slightly folded, medium sized, usually covering mid-dorsum; following ones, very small, leaving mid-dorsum and parapodia uncovered (fig. 3).

Parapodia sub-biramous (fig. 4A). Notopodia small, digitiform (fig. 4B). Neuropodia with longer rounded prechaetal lobes with subacicular digitiform acicular lobe; postchaetal lobes shorter, distally rounded; tips of noto- and neuroacicula penetrating epidermis (figs. 4B-4D, 5A, 5B). Nephridial papillae short, bulbous, starting on segment 6 (fig. 4E).

Notochaetae slightly thinner than neurochaetae, few in number (0-5), nearly smooth, unidentate; neurochaetae few in number, but more numerous (5-10) than notochaetae, with unidentate tips and faint serration, all of same type (fig. 4F, 4G).

Surface of elytra and body often covered with scattered, angular, extraneous particles.

*Measurements.* 75-120 chaetigers, L 26-44 mm, WW 1.2-1.5 mm, WC 2.6-3.3 mm (Table 2).

*Colour.* Living worms not seen. Alcohol preserved worms with light brown background, a prominent dark brown longitudinal mid-dorsal band along all body (figs. 1A, 1C, 2), and dark brown

Table 2. Variation in elytra distribution pattern and size in specimens of *Parahololepidella greeffi* associated to *Tanacetipathes* cf. *spinescens*. Asymmetrical and variable elytral positions are marked in italics. Width: WW/WC; R: right side; L: left side.

	Length (mm)	Width (mm)	Chaetiger numb.	Elytra numb.	Distribution of elytra
MNCN 16.01/ 13708 af	44	1.45/3.25	110	52	R 2 4 5 7 9 11 13 15 17 19 21 23 26 29 32 33 34 38 40 42 44 46 48 50 52 54 56 60 62 64 66 68 7 2 74 76 78 80 82 84 86 88 90 92 94 96 98 100 102 104 106 109 L 2 4 5 7 9 11 13 15 17 19 21 23 26 29 32 33 34 39 39 41 43 45 47 49 51 53 55 56 60 62 64 66 68 70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 100 102 104 106 109
MNCN 16.01/ 13707	42		120	51/49	R 2 4 5 7 9 11 13 15 17 19 21 23 26 29 32 33 35 39 42 44 46 48 54 56 58 60 62 64 66 68 70 72 74 76 84 87 90 92 95 97 99 101 102 103 105 107 108 110 112 116 119 L 2 4 5 7 9 11 13 15 17 19 21 23 26 29 32 34 36 38 39 42 44 46 54 56 58 60 62 64 66 68 70 72 74 76 84 87 90 95 98 99 101 102 103 105 108 110 112 116 119
MNCN 16.01/ 13705 af + pf	42	1.5/3.1	108	50/49	R 2 4 5 7 9 11 13 15 17 19 21 23 26 29 32 33 35 37 39 41 43 45 47 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 81 83 85 87 89 91 93 95 102 104 106 L 2 4 5 7 9 11 13 15 17 19 21 23 26 29 32 33 35 37 39 42 44 45 47 50 52 54 56 58 60 62 64 66 68 70 72 74 76 78 80 81 84 86 88 90 92 94 102 104 106
MNCN 16.01/ 13704 af + pf	27	1.2/2.6	90	40	R 2 4 5 7 9 11 13 15 17 19 21 23 26 29 32 34 36 38 40 42 47 48 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 81 83 86 L 2 4 5 7 9 11 13 15 17 19 21 23 26 29 32 34 36 38 40 42 47 48 51 53 55 57 59 61 63 65 67 69 71 73 75 77 79 81 86 88
NNMN 24481 af+ pf	35		99	43/45	R 2 4 5 7 9 11 13 15 17 19 21 23 26 29 32 36 38 40 42 44 46 48 50 52 54 56 59 60 64 66 68 70 72 73 76 78 82 84 86 91 92 96 97 L 2 4 5 7 9 11 13 15 17 19 21 23 26 29 33 34 35 37 39 41 43 45 47 49 51 53 55 57 59 60 63 65 67 69 71 72 75 77 81 83 85 89 92 96 97
NNMN 24644	26		75	35/34	R 2 4 5 7 9 11 13 15 17 19 21 23 26 29 32 34 36 38 40 42 44 46 48 50 52 54 56 58 60 62 64 66 68 70 72 L 2 4 5 7 9 11 13 15 17 19 21 23 26 29 32 34 36 38 40 42 44 47 49 51 53 55 57 59 61 63 65 67 69 71

pigmentation on cirrophores and, sometimes, on bases of cirri. Some specimens may also show a longitudinal dark brown band on ventral side, narrow in anterior segments, occupying nearly all body width from mid-body to posterior end (fig. 1B, 1D).

**Remarks.** Our specimens agree well with Pettibone's (1969) description. However, the syntype deposited at the ZMH was in a very poor state of preservation, being almost dehydrated (fig. 6A), to the extent that the chaetae were damaged (fig. 6B). The material from the museum included a few dissected parapodia in an additional jar, which appeared to be in better conditions (fig. 6D-F). The only differences with the parapodia of the newly collected material were that the neurochaetae seemed to be slightly thicker in the syntype, two of them appearing slightly bidentate (black arrow, fig. 6E). Taking into account the conditions of this material, however, we cannot dismiss the possibility that these two traits could have been caused by the dehydrating process suffered by the syntype.

Some of the features commonly used to discriminate species and, even, genera among polynoids are highly variable within the newly collected material. For instance, specimen MNCN 16.01/137094 lacks cephalic peaks, while they are present in specimen NNMN 24644. Also, the elytra distribution becomes asymmetrical (within a given worm) and irregular (between worms) from chaetiger 32 or 33 to the end of the body (Table 2). A similar variability was also described for another long bodied species, *Medioantenna variopinta* (Di Camillo et al., 2011). The shape of elytra may also vary. They are relatively large, covering prostomium and mid-dorsum up to chaetigers 15–23, becoming then very small and leaving the dorsum uncovered. However, several specimens also show some small anterior elytra leaving the dorsum uncovered, we suggest this being caused by the presence of regenerating (small) elytra and/or parapodia. The restricted distribution of these damaged elytra and/or parapodia, lead us to attribute its presence to intra-specific aggressive

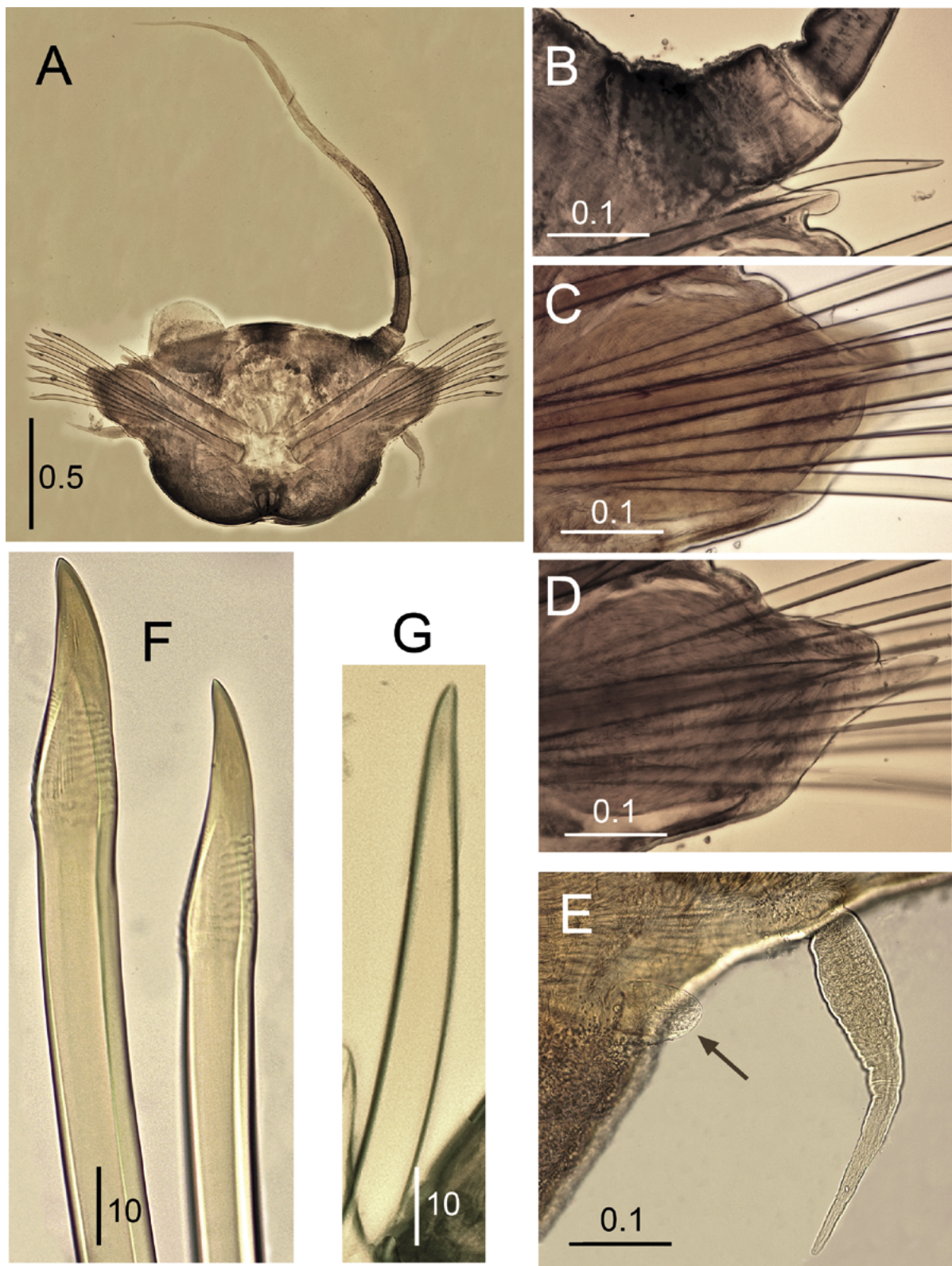


Figure 4.- *Parahololepidella greeffi*. MNCN 16.01/13708. Mid-body segment. A. Whole view of a transverse section, showing elytra and dorsal cirri on the same segment. B. Notopodium. C. Neuropodial acicular lobe. D. Neuropodial post-acicular lobe. E. Ventral cirri and nephridial papilla (black arrow). F. Neuropodial chaetae. G. Notopodial chaetae. Scale bars are cm (A) and mm (B-G).

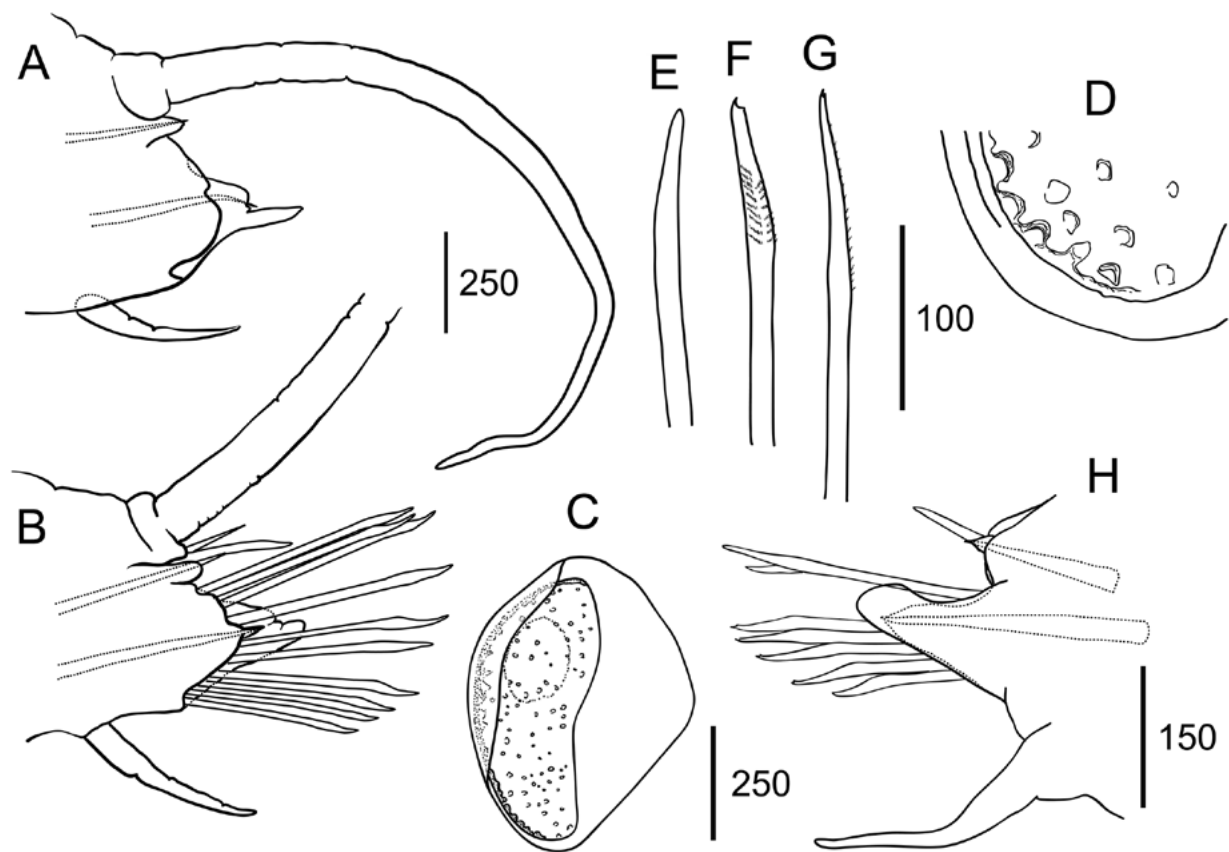


Figure 5.- *Parahololepidella greeffi*. MNCN 16.01/13708. Right cirriferous parapodium. A. From chaetiger 44, posterior view, chaetae omitted. B. From chaetiger 12, posterior view, with chaetae. *Gorgoniapolynoe caeciliae*. MNCN 16.01/14337. C. Left elytron of first pair; left margin folded on dorsal side. D. Detail of margin of same elytron. E. Notochaeta. F. Ventral-most neurochaeta. G. Dorsal-most neurochaeta. H. 35<sup>th</sup> parapodium. Scale bars are  $\mu\text{m}$ .

behaviour that seems to characterize different species of symbiotic polychaetes, particularly polynoids (e.g. Britayev et al., 2007).

Elytra also seem the reason why Rullier (1964) described a small (i.e. juvenile) specimen of *P. greeffi* as a new species, *Hololepidella fagei* Rullier, 1964. Being small, this specimen showed all elytra large, covering mid-dorsum, like those from anterior-most segments in larger worms. This species was synonymized with *P. greeffi* by Pettibone (1969) while describing *Parahololepidella* as a new genus.

**Ecology.** *Parahololepidella greeffi* was found at 0–30 m deep, living in association with colonies of the antipatharian *Tanacetipathes* cf. *spinescens*, while it was previously recorded as free living (Augener, 1918; Pettibone, 1969; Rullier, 1964). In fact, Rullier (1964) reported specimens of *H. greeffi* occupying white mucous tubes, incrustated with sand grains and fragments of shells. According to Pettibone (1969), these tubes were perhaps formed by some commensal host. However, the supposed presence of tubes was not observed in our material, as the worms were always directly attached to the surface of the host antipatharian, without any trace of tubes. They were crawling on the main stems of the plumose branches of the coral (fig. 7), having very similar, cryptic

colour (when preserved). All six colonies examined harboured polychaetes, two of them with several individuals on each colony (up to 6 in a 15x10 cm branch, MNCN 16.01/13707).

As previously reported for all known symbiotic polychaetes (Martin & Britayev, 1998), the finding of *P. greeffi* as symbiont reinforces the high diversity of the representatives of the family Polynoidae living in association with antipatharian hosts: of the 12 known species, eight are polynoids, three are species of *Eunice*, and the remaining one is a syllid (Table 3).

**Distribution.** Tropical and Equatorial East Atlantic, Cabo Verde and São Tomé Archipelagos.

#### Genus *Gorgoniapolynoe* Pettibone, 1991

Type species. *Gorgoniapolynoe bayeri* Pettibone, 1991

**Diagnosis.** Body dorso-ventrally flattened, with up to about 60 segments; elytra leaving mid-dorsum uncovered, except in anterior-most segments. 15 pairs of elytra on chaetigers 2, 4, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23, 26, 29, and 32. First 1–2 pairs of elytra modified, with translucent, chitinous central area. Prostomium wider than long, with rounded lobes and three



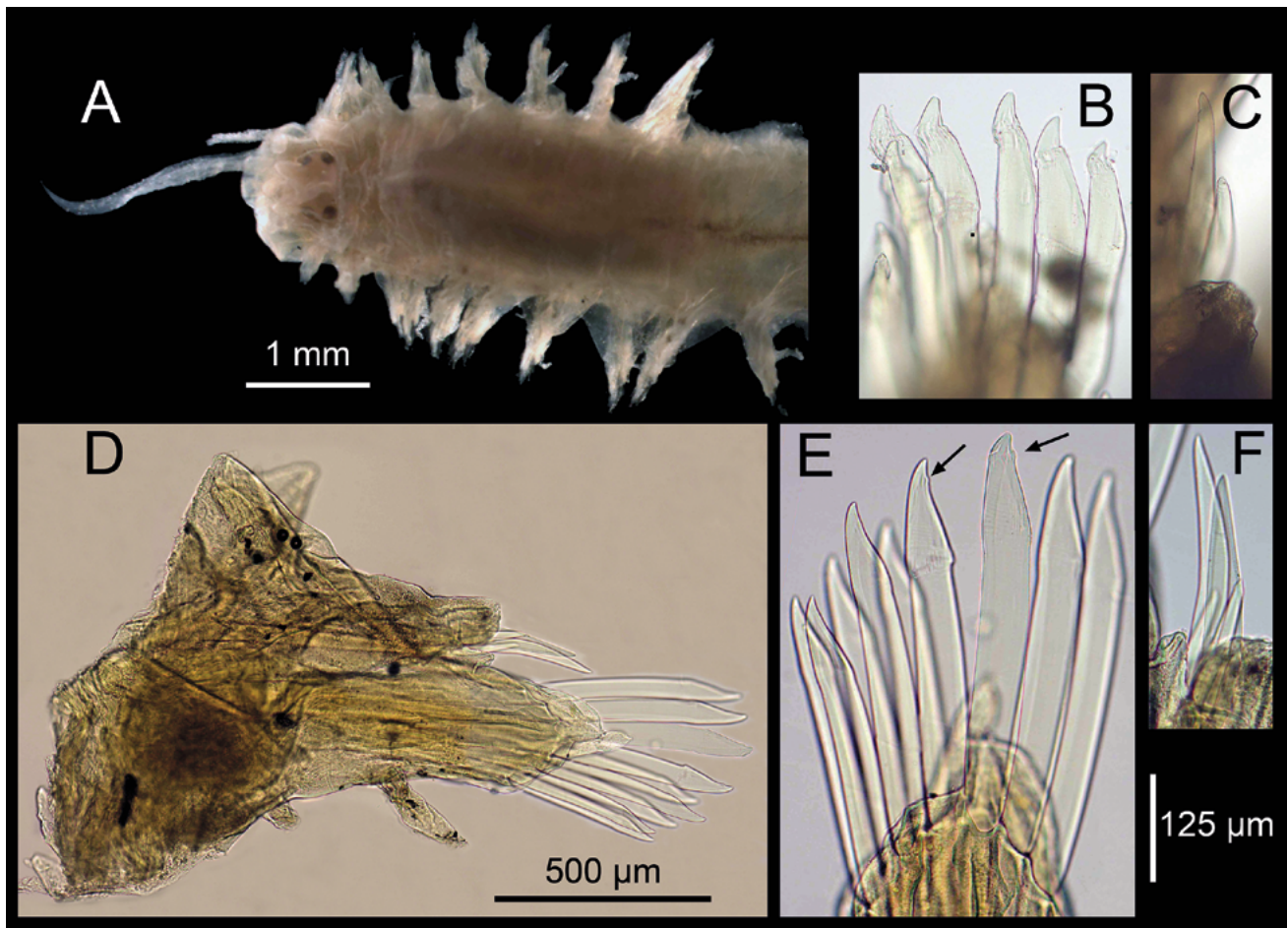


Figure 6.- *Parahololepidella greeffi*. Syntype ZMH 5692. A. Anterior end, dorsal view. B. Neurochaetae from anterior region, showing damaged tips. C. Notochaetae. D. Dissected parapodia from mid-body. E. Neurochaetae of the same (black arrow pointing at the apparently bidentate chaetae). F. Notochaetae of the same. B, C, E, F: scale bar 125 µm.

antennae; cephalic peaks absent or present; lateral antennae latero-ventral to median antenna. Two pairs of eyes. Parapodia with elongate acicular lobes, with noto- and neuroacacula penetrating epidermis; tip of neuropodia extending to supra-acicular process. Notochaetae few (0–7), stout, with blunt tip; neurochaetae few, but more numerous (7–15), of same width as notochaetae, usually bidentate. Prominent glandular area on bases of ventral cirri starting from chaetigers 11–18.

**Remarks.** This diagnosis agrees in general with that of Pettibone (1991a) and Barnich et al. (2013). The former paper included nine species in *Gorgoniapolynoe*, among which seven fit well with the generic diagnosis thus forming a compact species group. However, *Gorgoniapolynoe corralophila* (Day, 1960) and *Gorgoniapolynoe pelagica* Pettibone, 1991a differ in several features. Both species have more numerous noto- and neurochaetae; *G. corralophila* has three pairs of modified elytra and notochaetae with widely spaced rows of spines and long bare tips. The single known specimen of *G. pelagica* is small, has twelve pairs of elytra and notochaetae of two kinds: long, stouter

than neurochaetae, and short, of the same width as neurochaetae. This suggests that it could be a juvenile of another species. Accordingly, we propose that *G. corralophila* should be referred to a different genus and that *G. pelagica* could be a juvenile and thus the species should be considered as *nomen dubium*.

#### *Gorgoniapolynoe caeciliae* (Fauvel, 1913)

Zoobank LSID. <http://zoobank.org/urn:lsid:zoobank.org:act:ACBD73A0-486E-4DE0-A72C-C553F46A7481>

(Figs. 5C–H, 8–10)

*Polynoe caeciliae*: Fauvel (1913), 24, fig. 7A–D; Fauvel (1914), 69, pl. 4, figs. 1–6, 18–19; Hartmann-Schröder, 1985: 31–33, figs. 1–5 (in part; not specimens from Indian Ocean, not figs. 6–11).

*Gorgoniapolynoe caeciliae*: Pettibone (1991a), 704, figs. 12–14.

**Material examined.** Galicia Bank, NW Iberian Peninsula. Host *Candidella imbricata*. MNCN 16.01/14337: 3 specimens from different colonies, Sta. DR10-14/08/2010, INDEMARES 2010 expedition, 1482 m depth, 42°27.672'N 011°59.233'W. MNCN 16.01/14338: 1 specimen from one colony, Sta. DR16- 24/08/2010, INDEMARES 2010

Table 3. List of known polychaete species associated with antipatharian hosts. 1) Hartmann-Schröder & Zibrowius (1998); 2) Molodtsova & Budaeva (2007); 3) Pettibone (1991b); 4) Wagner et al. (2012); 5) Pettibone et al. (1970); 6) Hanley & Burke (1991); 7) Barnich et al. (2013); 8) this paper; 9) Glasby (1994); 10) Glasby & Krell (2009).

Family	Species	Host	References
Eunicidae	<i>Eunice antipathum</i> (Pourtalès, 1867)	<i>Distichopathes filix</i> (Pourtalès, 1867)	1,2
		<i>Elatopathes abietina</i> (Pourtalès, 1874)	1,2
Eunicidae	<i>Eunice kristiani</i> Hartmann-Schröder & Zibrowius, 1998	cf. <i>Antipathes cylindrica</i> Brook, 1889	1,2
Eunicidae	<i>Eunice marianae</i> Hartmann-Schröder & Zibrowius, 1998	cf. <i>Antipathes cylindrica</i> Brook, 1889	1,2
Polynoidae	<i>Antipathypolyeunoa nuttingi</i> Pettibone, 1991b	<i>Tanacetipathes tanacetum</i> (Pourtalès, 1880)	3,4
Polynoidae	<i>Bayerpolynoe floridensis</i> Pettibone, 1991b	<i>Stylopathes columnaris</i> (Duchassaing, 1870)	3,4
Polynoidae	<i>Benhamipolynoe antipathicola</i> (Benham, 1927)	<i>Stylopathes tenuispina</i> Silberfeld, 1909	5
		<i>Stylopathes columnaris</i> (Duchassaing, 1870)	4,5
Polynoidae	<i>Brychionoe karenae</i> Hanley & Burke, 1991	<i>Leipathes</i> sp.	6
Polynoidae	<i>Eunoe purpurea</i> Treadwell, 1936	<i>Bathypathes</i> cf. <i>alternata</i> Brook, 1889	7
Polynoidae	<i>Neohololepidella antipathicola</i> Hartmann-Schröder & Zibrowius, 1998	<i>Elatopathes abietina</i> (Pourtalès, 1874)	1,2
		<i>Distichopathes filix</i> (Pourtalès, 1867)	1,2
Polynoidae	<i>Parahololepidella greeffi</i> (Augener, 1918)	<i>Tanacetipathes</i> cf. <i>spinescens</i> (Gray, 1857)	8
Polynoidae	<i>Tottonpolynoe symantipatharia</i> Pettibone, 1991b	<i>Parantipathes</i> sp.	3
Syllidae	<i>Bollandiella antipathicola</i> (Glasby, 1994)	<i>Antipathes</i> sp.	2,9,10

expedition, 1423 m depth, 42°28.838'N 011°55.873'W.

Avilés Canyon System, Bay of Biscay, N Iberian Peninsula. Host *Corallium niobe*. MNCN 16.01/14341: 1 specimen, Sta. DR16-05/08/2010: 1 specimen from one colony fragment and several colony fragments without polychaetes but showing modifications of the axis front resulting from the interaction with the polychaetes, INDEMARES 2010 expedition, 928 m depth, 44°01.509'N 005°42.898'W.

**Additional material:** Voucher specimens deposited in the IEO laboratory, Gijón (Spain), and INSUB, Museo de Okendo, Donostia-San Sebastián. Galicia Bank, NW Iberian Peninsula. Host *Candidella imbricata*. Sta. DR10-14/08/2010: 32 specimens from seven colonies and fragments, INDEMARES 2010 expedition, 1482 m depth, 42°27.672'N 011°59.233'W. Sta. DR16-24/08/2010: 18 specimens from one colony and fragments, INDEMARES 2010 expedition, 1423 m depth, 42°28.838'N 011°55.873'W. Sta. DR04-22/07/2011: 1 specimen from one colony fragment, INDEMARES 2011 expedition, 1288 m depth, 42°58.419'N 12°02.982'W. Sta. DR12-05/08/2011: ca. 72 specimens from three colony fragments, INDEMARES 2011 expedition, 1585 m depth, 42°32.157'N 12°03.795'W. Host *Corallium* sp. Sta. DR08-13/08/2010: one dead colony with likely worm-induced galleries, without worms, INDEMARES 2010 expedition, 1196 m depth, 42°55.941'N 12°05.149'W.

**Diagnosis.** Prostomial lobes rounded, without cephalic peaks; first pair of elytrae modified with crescent shaped area on lateral side, transparent, chitinous, with scattered rounded microtubercles and elongate globular micropapillae (figs. 5C, 5D, 8A, 8B); remaining elytrae translucent almost circular with slightly folded borders (fig. 8C); dorsal cirri with scarce clavate papillae, mainly

at basis (fig. 8D); parapodia as in generic diagnosis (figs. 5H, 8D), with big, digitate nephridial papillae (fig. 8E); 0–3 notochaetae, stout, with blunt tips (figs. 5E, 8F); 8–15 neurochaetae, as stout as notochaetae, bidentate (figs. 5F, 5G, 8G, 8H).

**Measurements.** 37–49 chaetigers, L 7.0–17.0 mm, WW 0.9–1.6 mm, WC 1.4–2.3 mm.

**Remarks.** The Iberian specimens agree well with the re-description of the species by Pettibone (1991a), except in the presence of clavate papillae on dorsal cirri, which were neither mentioned nor figured in the original description.

**Ecology.** *Gorgoniapolynoe caeciliae* lives in association with different species of octocorals belonging to the Acanthogorgiidae, Primnoidae and Coralliidae (Barnich et al., 2013; Bayer, 1964; Eckelbarger et al., 2005; Pettibone, 1991a). The polychaetes were observed in all sampling stations where the host *C. imbricata* (Primnoidae) was obtained, from 1288 m to 1585 m deep, living inside galleries formed by highly modified sclerites of the gorgonian (figs. 9A–9D), similar to those described by previous authors in the same host (see Cairns, 2004, on colonies from W Atlantic), but also on the acanthogorgiid gorgonian *Acanthogorgia armata* Verrill, 1878 and *A. aspera* Pourtalès, 1867, and on the primnoid gorgonian *Callogorgia* sp. (see Barnich et al., 2013; Britayev, 1981, and references herein).

Similar galleries (some with worms inside) were observed in other species of *Candidella*, such as *C. helminthophora*



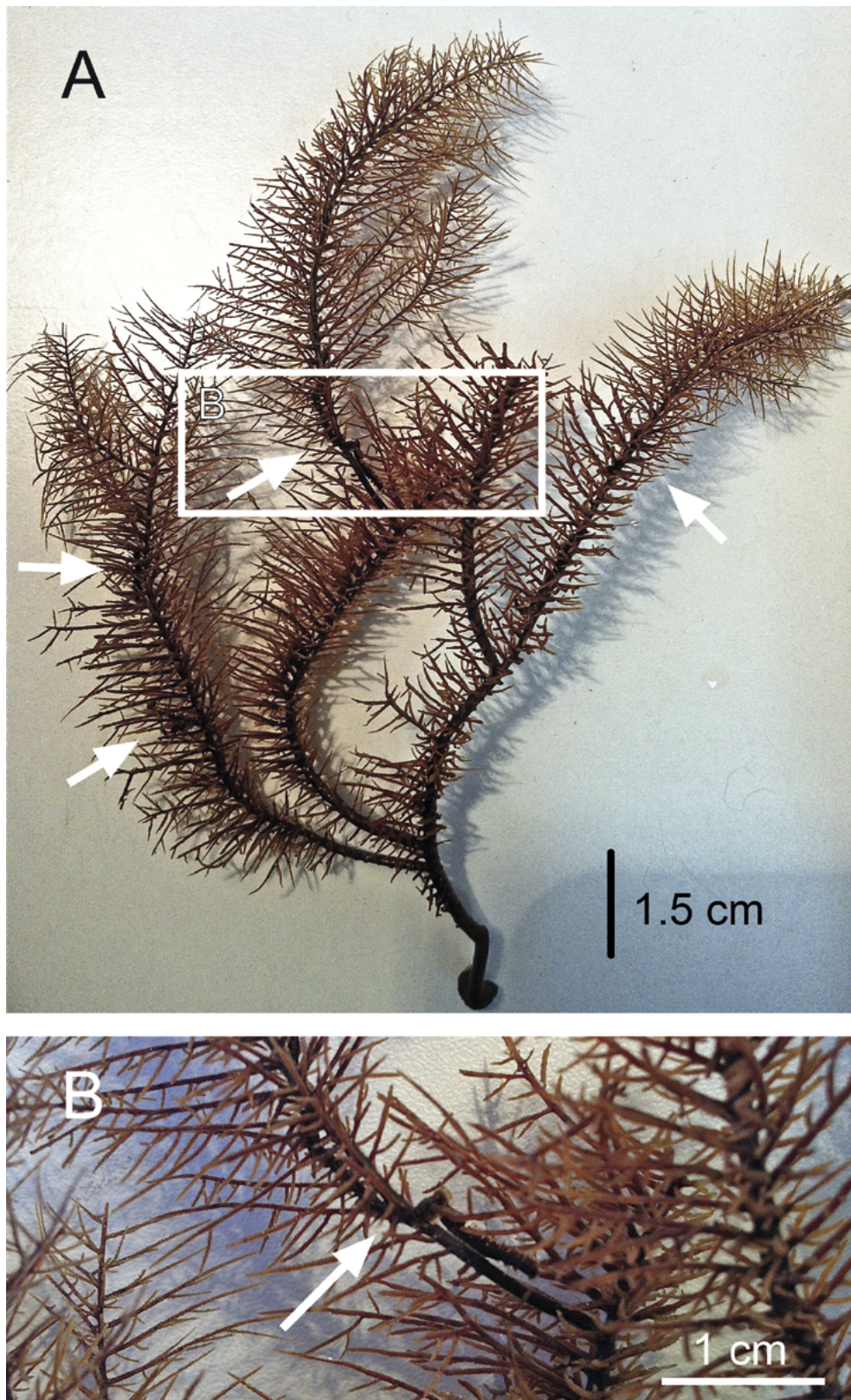


Figure 7.- *Tanacetipathes cf. spinescens*. MNCN16.01/13707. A.- Whole view of a host colony harbouring four specimens of *Parahololepidella greeffi*. B. Detail of a host curled on the main stem of the host black coral. White arrows point to the position of the symbionts.



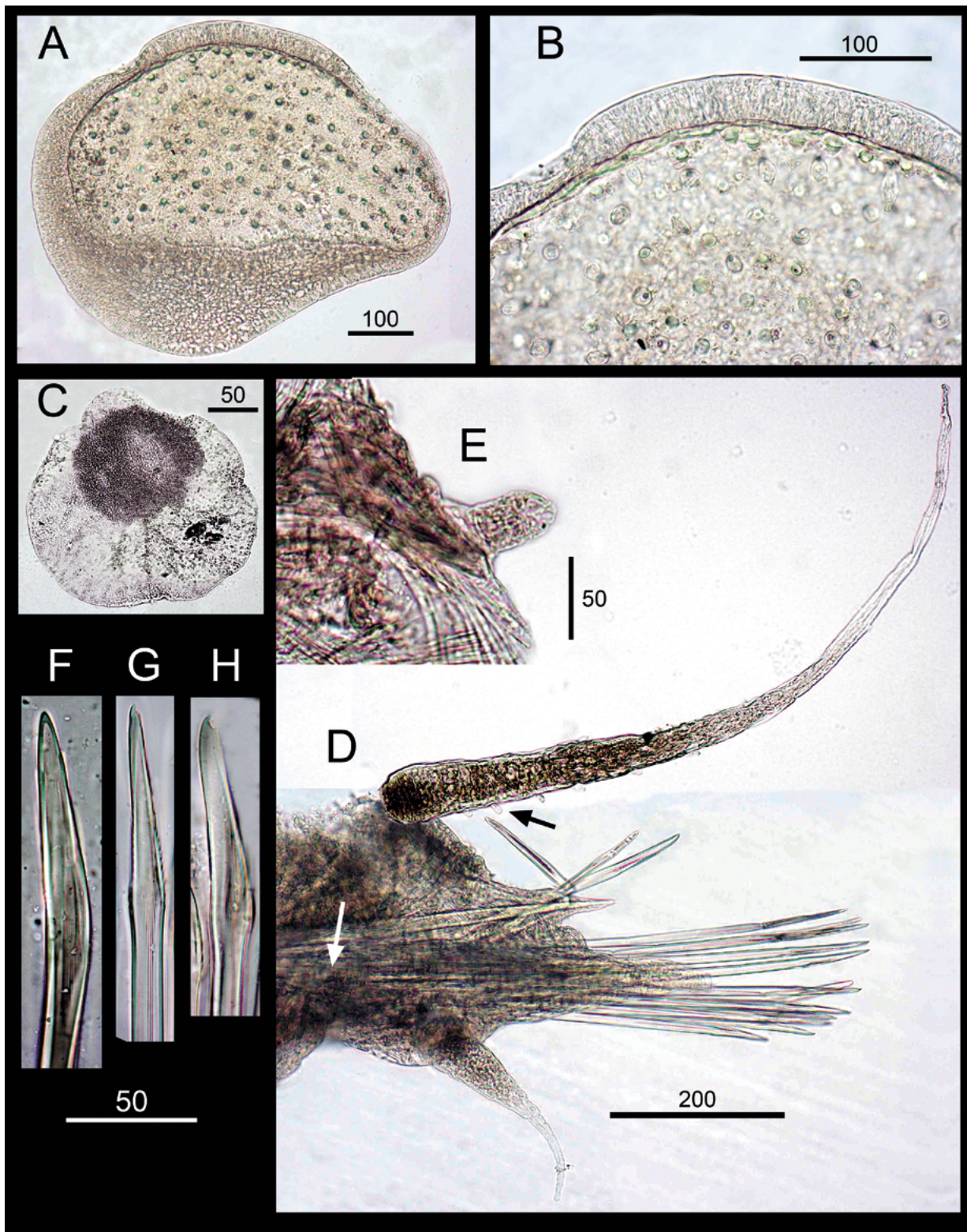


Figure 8.- *Gorgoniapolynoe caeciliae*. MNCN 16.01/14337. A. Left elytron from first pair. B. Detail of margin of same. C. Elytron from mid-anterior region. D. Parapodium from chaetiger 32, dorsal cirri broken (placed in approximate position); black arrow pointing on the small scattered papillae on cirri; white arrow pointing on the approximate position of nephridial papilla. E. Nephridial papilla. F. Notochaetae. G. Neurochaetae from dorsal-most bundle. H. Neurochaetae from ventral-most bundle. Scale bars are  $\mu\text{m}$ .



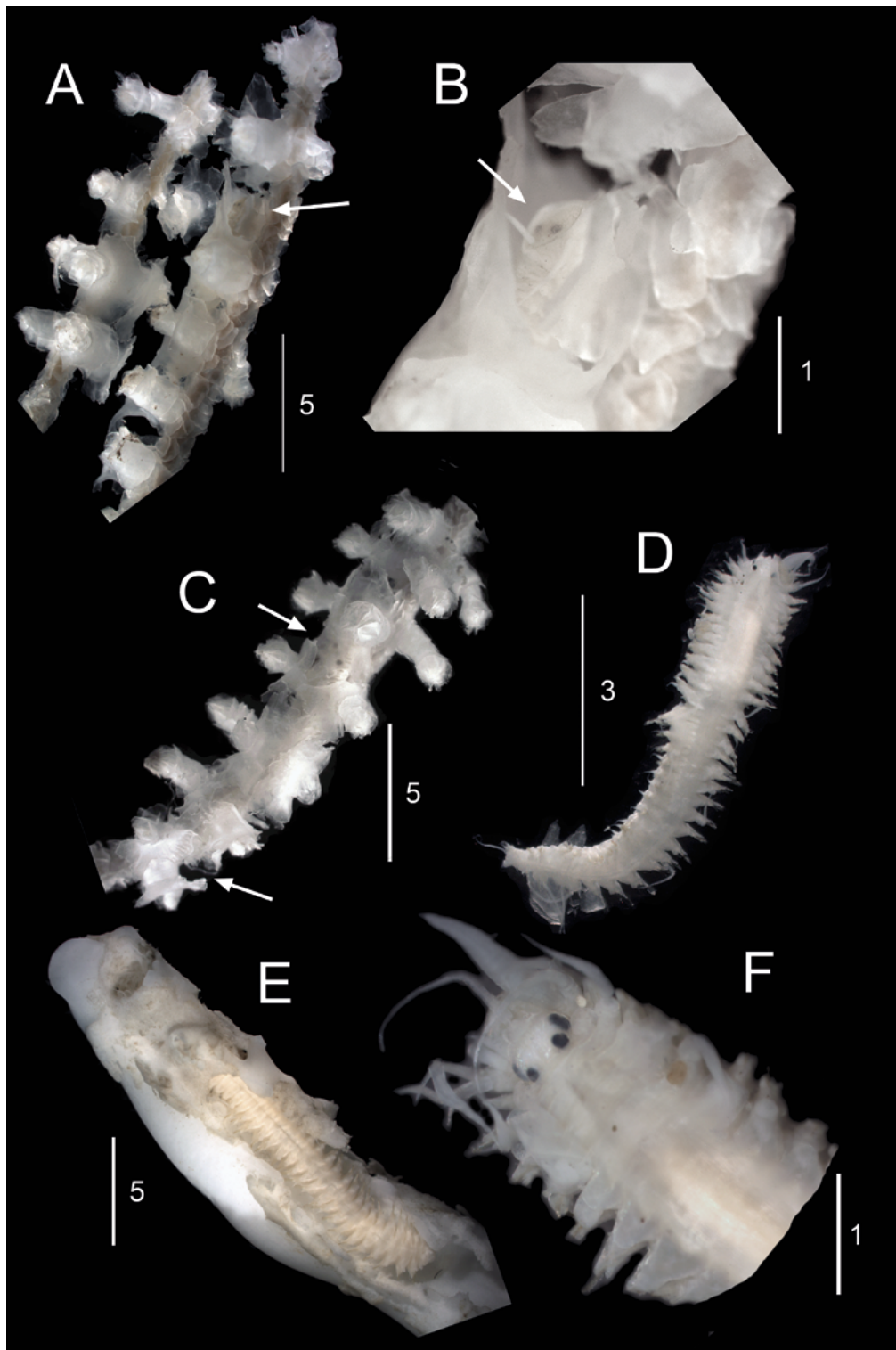


Figure 9.- *Gorgoniapolynoe caeciliae*. MNCN 16.01/14337. A. Two fragments of *Candidella imbricata*, one of them with the symbiont inside a gallery formed by expanded esclerites (arrow pointing on worm's head). B. Detail of the anterior end of the worm (arrow pointing on worm's head showing eyes through the first pair of elytra). C. Fragment of *Candidella imbricata* with the symbiont inside a gallery formed by expanded esclerites (arrows pointing on worm's head and pygidium). D. Same worm as in C, extracted from the gallery. MNCN 16.01/14341. E. Fragment of *Corallium niobe*, with a worm inside a gallery in the axis of a branch. F. Anterior end of the same worm as in E, extracted from the gallery. Scale bars are mm.

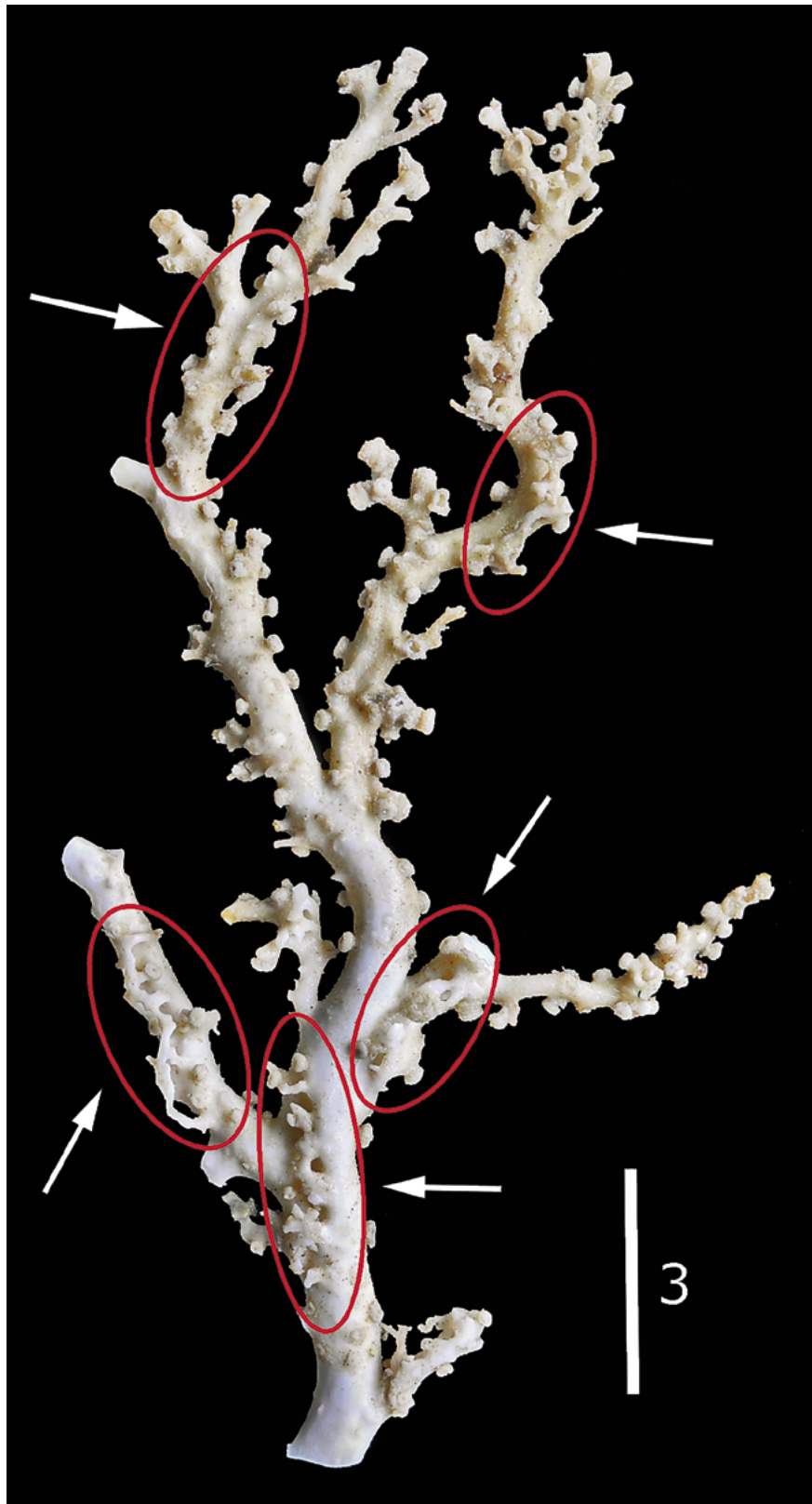


Figure 10.- Dead colony of *Corallium* sp. showing traces of galleries (pointed by white arrows and outlined by red tracing) likely originated for the association with *Gorgoniapolynoe caeciliae*. Scale bar is cm.

(Nutting, 1908) from Hawaii (Cairns, 2009; Nutting, 1908). Other Hawaiian gorgonians, belonging to the genus *Narella* (Primmidae), such as *N. alata* Cairns & Bayer, 2008, *N. macrocalyx* Cairns & Bayer, 2008 and *N. vermifera* Cairns & Bayer, 2008 (Cairns & Bayer, 2008), showed similar galleries with worms. However, the polychaetes in these four host species were not identified. Thus, it is not possible to assess whether they belong to the same polynoid species or to a similar one. For instance, *Gorgoniapolynoe galapagensis* Pettibone, 1991a was described in association to *Narella ambigua* (Studer, 1894) from Galapagos Islands (Eastern Central Pacific Ocean) and *Gorgoniapolynoe bayeri* Pettibone, 1991a, associated with *Narella clavata* (Versluys, 1906), occurred in Philippine Islands (North Pacific Ocean).

*Gorgoniapolynoe caeciliae* was also reported in association with five species of *Corallium* (Coralliidae), *C. bayeri* Simpson & Watling, 2011, *C. johnsoni* Gray, 1860, *C. niobe* Bayer, 1964, *C. secundum* Dana, 1846 and *C. tricolor* (Johnson, 1898) (Bayer, 1964; Fauvel, 1913; Hartmann-Schröder, 1985; Simpson & Watling, 2011; Stock, 1986). It must be pointed out that Stock (1986) reported *C. profundum* Dana, 1846 as a host for the polychaete, but this species does not exist and most likely was a misspelling for *C. secundum*. When associated with *Corallium*, including our sample of *C. niobe* (figs. 9E, 9F), the worms induce malformations in the host branches, which form entirely covered galleries that contain a single worm inside (see Barnich et al., 2013, and references herein). Similar galleries were also depicted by Bayer (1956) on *C. secundum* and Bayer (1964) on *C. niobe*, but the worms were not identified. The dead colony of *Corallium* found in Galicia Bank completely lacked the original soft tissues (those observed in the picture correspond to secondary colonization of the coral skeleton by a zoantharian), this preventing the identification to species level. However, the skeleton also showed traces of several galleries (fig. 10), which agree with those found on the living colonies of *C. niobe* harbouring the polychaete at the Avilés Canyon System.

In all cases, all the galleries were not excavated on the coral skeleton but appeared to be produced by the coral tissues and skeleton overgrowing the original soft tube produced by the worm (which may still be observed laying between the coral tissues and the worms themselves), in a similar way to the modifications induced by *Eunice norvegica* (Linnaeus, 1767) on its host scleractinian coral *Lophelia pertusa* (Linnaeus, 1758) (Mueller et al., 2013). This suggests that *G. caeciliae* may play an equivalent, functional role to that of *E. norvegica* in structuring the assemblages of its coral hosts.

**Distribution.** Widely distributed in the NW and NE Atlantic, from 400-1500 m depth according to Barnich et al. (2013). The present report includes a slightly deeper depth range (down to 1585 m) and is the first mention of the association between *G. caeciliae* and *C. imbricata* for Spanish waters. The presence of the polychaete in different locations from N and NW Iberian waters was previously reported by Fauvel (1913), Hartmann-Schröder (1985) and Pettibone (1991a) in association with *Corallium* species (i.e. *C. niobe* and *C. johnsoni*).

## Acknowledgements

The present study was partly financed by the Russian Foundation of Basic Researches (grant No 12-05-00239-a) and the European Community through the INDEMARES-LIFE project (07/NAT/E/000732) and is a contribution of D. Martin to the Consolidated Research Group 2014 SGR 120 of the Generalitat de Catalunya and to the Research Project CTM2013-43287-P, funded by the Spanish State Research Plan. We wish to thank Dr. T. Molodtsova from the Institute Oceanology RAS for the identification of the antipatharian host and for providing us with additional specimens of *P. greeffi*, and the two anonymous reviewers for their insightful comments on the manuscript.

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